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GODDARD NEWS

GODDARD SPACE FLIGHT CENTER / GREENBELT, MARYLAND

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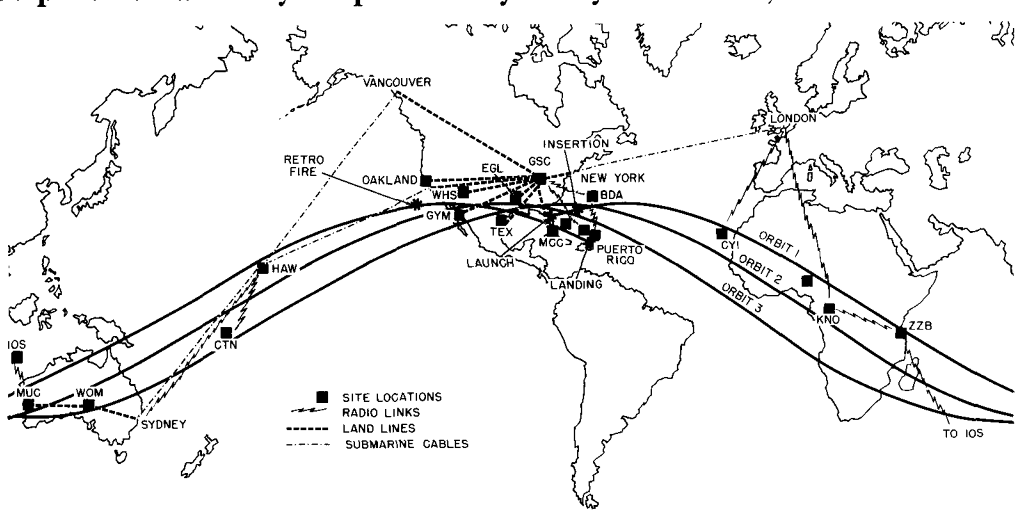
Goddard Mercury Team Ready To "Go" for MA-7

This week, the Goddard staff manning NASA's world-wide Mercury net readied itself for the MA-7 mission.

The mission is a second test to evaluate the performance of a manspacecraft system; and to investigate man's capabilities in the space environment; and to obtain the pilot's opinions on the suitability of the spacecraft and supporting systems for manned space flight.

The flight is scheduled no earlier than May 19. The launch will be attempted between 7 a.m. and 12:30 p.m. EST and may "slip" on a day-to-day basis as required. Launch timing will be planned to provide at least three hours of daylight search time in the probable recovery areas.



GODDARD'S MERCURY NETWORK . . . world-wide tracking stations ready.

Mercury Network

For this operation, Goddard's Mercury Tracking Network consists of 17 stations around the world, including a ship, the Coastal Sentry. The Coastal Sentry will be stationed in the Mozambique Channel off the east coast of Africa instead of the middle of the Indian Ocean as in past Mercury tests.

The Atlantic ship, normally stationed off the coast of West Africa, will not take part in this exercise. It is in Baltimore for repairs.

Some 500 technicians man the Mercury stations, all of which are in radio or cable communications with the Mercury Control Center at the Cape via GSFC.

World-wide Mercury Tracking Stations, including a ship off east Africa, will monitor the MA-7 flight. The Goddard

(Continued on page 2)

Alaskan "Big Dish" Station Ready for NIMBUS

The largest State in the Union recently acquired another claim to distinction — the largest, most sophisticated GSFC satellite ground station in the world. The new station, located near Fairbanks, Alaska, and officially known as the Alaska Data Acquisition Facility, was built at a total cost of about 5 million dollars.

The first satellite program to utilize this station will be Goddard's NIMBUS weather satellite, successor to TIROS.

Goddard's EGO (Eccentric Geophysical Observatory) and POGO (Polar Orbiting Geophysical Observatory) will also use these facilities.

The project initially directed by Dr. Coates, Chief of the Space Data Acquisition Div. is now under the direction of Mr. C. H. Looney, Assistant Chief, Tracking Systems Division. Mr. C. C. Johnson, Head, Advanced Low Noise Techniques, RF Systems Branch served as NASA Coordinator at the station.

Operations associated with the location and construction were initially directed by Mr. H. Hoff, Associate Chief, Operations and Support Division. Final stages of these operations, especially the erection of the large antenna dish were directed by Mr. L. E. Brown, Head of Goddard's Field Facility Branch.

This is the first of four new stations slated for construction on the North American Continent. The remaining three stations, now in various stages of planning, will be located as follows; a second facility near Fairbanks, Alaska; a facility at the Rosman site near Asheville, North Carolina; and a facility in eastern Canada.

Contract negotiations for major portions of all four stations is being handled by Mr. Al Riskin, Procurement and Supply Division.

The most impressive structure on the site is a giant parabolic antenna, 85 feet in diameter, built by Blaw-Knox and erected by the Radio Construction Corporation with the Alpha Corporation as prime construction contractor for the station.

(Continued on page 2)

Summer Workshop Program At Goddard

A summer workshop program in "Simulation", sponsored by Goddard's Test and Evaluation Division will be conducted from June 14 through September 15.

The Seminar is designed to promote the exchange of technical information between scientists and the Goddard staff. During the twelve week program university faculty, representing various disciplines, and

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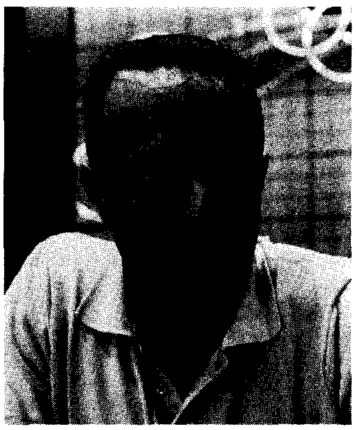
MERCURY

Space Computing Center will make trajectory computations.

Instantaneous Analysis

During the flight, information will pour into the Space Computing Center from tracking and ground instrumentation points around the globe at the rate, in some cases, of more than 1,000 bits per second. Upon almost instantaneous analysis, the information will be relayed to the Cape for action.

In addition to again proving man's capabilities for surviving in and performing efficiently in space—and since only three other orbital flights have been made along the world-wide tracking network—the test will further evaluate the capability of the network to perform



MERCURY Astronaut M. Scott Carpenter

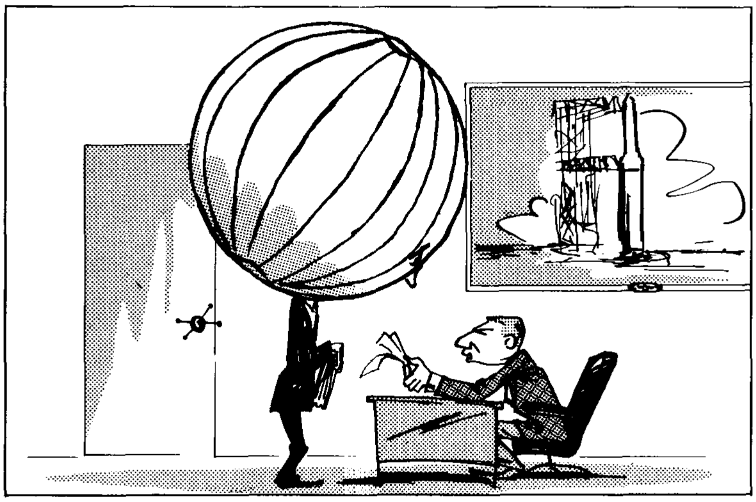
tracking, data-gathering, and flight control functions.

Mercury missions, because of the "man-factor," require instantaneous communication. Tracking and telemetered data must be collected, processed, and acted upon in as near "real" time as possible. The position of the vehicle must be known continuously from the moment of liftoff.

After injection of the Mercury spacecraft into orbit, orbital elements must be computed and prediction of "look" information passed to the next tracking site so the station can acquire the spacecraft.

$60 Million Net

Data on the numerous spacecraft systems must be sent back to earth and presented in near actual time to observers at various stations. And during the recovery phase, spacecraft impact location predictions will have to be continuously revised and relayed to recovery forces.



Well—and what makes you so qualified to work on the Echo project?

During late 1961, an industrial team headed by the Western Electric Company turned over this $60 million plus global network to Goddard.

Altogether, Goddard's Mercury system involves approximately 60,000 route miles of communications facilities to assure an integrated network with world-wide capability for handling satellite data. It comprises 140,000 actual circuit miles—100,000 miles of teletype, 35,000 miles of telephones, and over 5,000 miles of high-speed data circuits.

Sites linked across the Atlantic Ocean are: Cape Canaveral, Grand Bahama Island. Grand Turk Island, Bermuda. and Grand Canary Island.

World-wide Communications

Other stations in the continental United States are at Point Arguello in Southern California; White Sands, New Mexico; Corpus Christi, Texas; and Eglin Florida. One station is located on Kauai Island in Hawaii.

Stations at overseas sites include one on the south side of Grand Canary Island, 120 miles west of the African Coast; Kano, Nigeria, in a farming area about 700 rail miles inland; Zanzibar, an island 12 miles off the African coast in the Indian Ocean; two in Australia—one about 40 miles from Perth, near Muchea, and the one near Woomera; Canton Island, a small coral atoll about halfway between Hawaii and Australia; one in Mexico near Guaymas on the shore of the Gulf of Mexico; and one in Bermuda, a backup control center.

Computers Analyze Data

Data are transmitted to Goddard where IBM 7090's compare the spacecraft trajectory to a pre-determined flight path—and flash the results to Canaveral. This is a "real" time operation—that is, the system receives, moves it over 2,000 miles, analyzes, predicts, and displays data so that observers and controllers follow events as they happen.

Spacecraft Named Aurora

The MA-7 spacecraft has been named Aurora 7 by the Astronaut, M. Scott Carpenter.

In exercising the pilot perogative of naming the craft, Carpenter said he settled on Aurora 7 "Because I think of Project Mercury and the open manner in which we are conducting it for the benefit of all as a light in the sky. Aurora also means dawn—in this case, dawn of a new age."

Carpenter also confides that he grew up on the corner of Aurora and 7th in Boulder, Colorado.

4,200 lb Craft

The craft stands 9½ feet high and measures six feet across the base. Spacecraft weight at launch will be about 4,200 pounds; spacecraft weight in orbit (after escape tower jettison) will be approximately 3,000 pounds; and about 2,400 pounds on-the-water recovery weight.

Launch Vehicle

A modified Atlas D is used to launch orbital Mercury missions, reaching a speed of about 17,500 miles per hour. At launch, spacecraft and launch vehicle stand 93 feet tall.

(Continued from page 1)

"BIG DISH"

The "Big Dish" stands 120 feet tall when the antenna is aimed directly upward. Its total weight, including the pedestal, is approximately 400 tons. The Dish has the distinction of being the largest known antenna of its kind using an X-Y mount.

Unlike most similar antennas, the Alaska Dish does not rotate about an axis perpendicular to the surface of the earth. Instead, the antenna "tilts" 180° about two axes, simultaneously. One axis, the X axis—is orientated North-South; the other axis—the Y axis—is displaced 90° from the X axis. This allows 180° of rotation about the Y axis at every possible position with the 180° arc about the X axis to provide complete hemispherical coverage above the horizon except for 10° radius "keyholes" due north and south on the horizon.

The X-Y mount allows the Dish to be completely counter-balanced and moved by a hydraulic drive system which uses only one 250-hp electric motor. The Dish can be accelerated about each axis at a rate

Goddard's New Station near Fairbanks, Alaska.

of five degrees-per-second-per-second, to a maximum angular velocity of 3° per second.

The electronic equipment associated with the anntena is installed in a complex of buildings designed to withstand the near 70° below zero Alaskan temperatures. The complex is entirely self-sufficient, it has its own electrical and water supplies.

The basic tracking electronics is an emplitude monopulse Auto-track system designed and built by Collins Radio Corporation.

The system aims the antenna at the radiating source aboard a satellite automatically, within an angular accuracy of approximately 60 seconds of arc. It does this by moving the antenna in the proper direction to maintain equal amplitude at each of four dipoles antennas located at the focal point of the Dish.

The 85-foot Alaska Dish and its associated electronic systems will provide tracking and data acquisition for satellites in polar orbits at 136 Mc, 400 Mc, and 1700 Mc. At 136 Mc, most tracking will be performed by the Minitrack network including one installation near the Dish, so the Dish will be used almost exclusively for telemetry opera-

(Continued in next column)

tions. However, at 400 Mc, and 1700 Mc, the dish will acquire both tracking and telemetry data. It will be the first GSFC station to operate at either of these frequencies. Two of the satellites scheduled to use the 85-foot Dish at 400 Mc, are EGO and POGO. The first satellite program involving the Dish at 1700 Mc, will be Project NIMBUS.

The frequency versatility of the Big Dish is not its only important quality. It also has the capability to supply better telemetry data from orbiting satellites than existing GSFC antennas, and to follow probe vehicles further into space. This is possible because of the extreme RF sensitivity of the Dish. It is fully operational at signal levels as low at 180 dbw. This is equivalent to a power level at the antenna of 10-18 watts.

An interesting auxiliary feature of the Alaska installation is a closed circuit TV system, used for calibration of the Dish. A TV Camera mounted on the DISH allows precise manual aiming at a remote calibration antenna tower, at brighter satellites, and at various radiating stars. Any difference between the optical direction and the RF direction measured by the electronic systems is corrected for in subsequent operational tracking data.

Installation of the equipment at the Alaska Station was handled jointly by the Alpha Corporation and GSFC, with the Geophysical Institute of the University of Alaska supplying the physical plant.

Check-out of the installation was completed recently. At that time, the station was turned over to the University of Alaska for final alignment of the antenna axes and other minor calibration operations. Under a NASA contract, the University of Alska has responsibility for operation of the station, which will be completely operational well in advance of the first scheduled satellite launch.

U.S.-Japanese Space Probes Continue

Two joint U.S. and Japanese experiments for the scientific exploration of space are scheduled for launching on a Nike-Cajun Sounding rocket from Wallops Island, Virginia.

The two flights scheduled in the near future are a continuation of the first launching, which was held at Wallops Island on April 26, 1962. All three flights are designed to probe the ionosphere by the simultaneous use of different techniques developed independently in Japan and the United States.

Goddard's scientists report that the first flight apparently functioned properly and that the data acquired is now being analyzed. The additional flights are scheduled to compare the performance of the instruments in the nighttime as well as daytime ionosphere and to study day-to-day variation in the ionosphere.

A radio-frequency resonance probe experiment which has been flight-tested on Kappa sounding rockets in Japan is being supplied by the Radio Research Laboratory, Tokyo. During these flights, the experiment recorded the ionosphere's electron temperature and density at the same time.

Scientists from NASA's Goddard Space Flight Center are furnishing a Langmuir probe, a device which has been used for many years in the laboratory and in rocket flights to measure electron temperatures.

According to Robert Bourdeau, Head, Planetary Ionosphere Branch at Goddard, the Japanese experiment may permit space scientists in the future to use just one instrument to measure electron density and temperature simultaneously, and at a much faster rate.

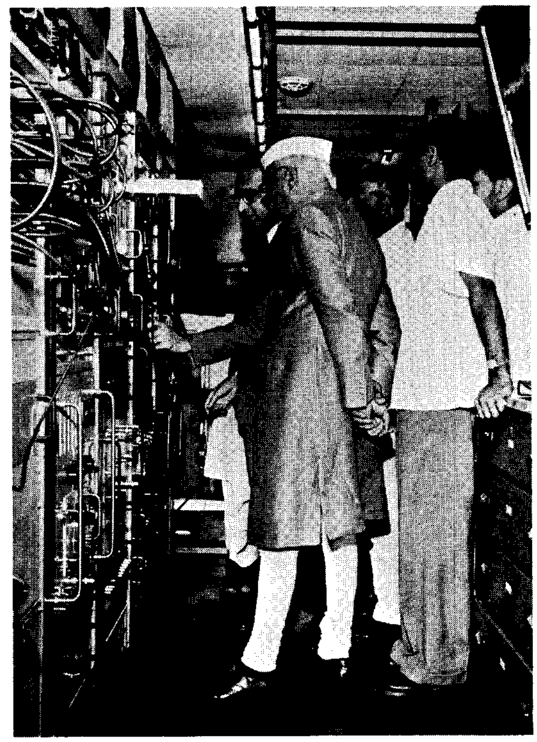
The Japanese have worked on their experiment for nearly three years. An arrangement was made some months ago to fly the instrumentation on U.S. rockets in order to compare techniques. This portion of the payload of the Nike-Cajun rocket was prepared in Japan while the other half was prepared at Goddard Space Flight Center.

INDIAN PRIME MINISTER VISITS TRACKING STATION

India's Prime Minister Jawaharlal Nehru was a recent visitor to the Ahmedabad tracking station located about 300 miles north of Bombay, India. The Prime Minister was accompanied by Indian Scientists.

The Goddard-built trailer station was sent to India last year.

TOP—Left to right; (first man not identified) K. R. Ramnathan, Director of the Physical Research Laboratory, Ahmedabad; Dr. V. A. Sarabhai, Chairman of the Indian Space Research Committee; and E. V. Chitnis, Station



Director with Mr. Nehru standing outside the Goddard built tracking trailer. In other photo Dr. E. V. Chitnis Station Director, explains operations and equipment to the Prime Minister and party.

(Continued from page 1)

SUMMER WORKSHOP

and associated graduate students will work with Goddard scientists and technicians.

The professor - graduate student teams will undertake specific projects in the simulation of space environment which are of primary concern to Goddard. A comprehensive project report will be issued at the conclusion of this program.

In addition, Goddard scientists will present selected topics on space environment simulation in weekly seminars, for study by the summer workshop staff.

Formal lectures by both the NASA staff and the summer workshop group will be scheduled to gain better understanding of the space age technical problems. Included are the following topics:

Solar Simulation and Albedo on Spacecraft; Heat Transfer and Cryogenic Pumping in Vacuum Technology; Corona and Discharge Effects Inside Spacecraft at Low External Pressure; Magnetic Simulation; Response of Vehicle Structures to Acoustic Fields and Relating Damage and Reliability to Environmental Data.

Workshop Participants include: Dr. Murray Geller, Assistant Professor of Physics, Howard University; Dr. Ralph A. Goodwin, Professor, Science Department United States Naval Academy; Dr. Graham D. Gutsche, Associate Professor, Science Department United States Naval Academy; Dr. Judah Leon Shereshefsky, Professor and Head of Department of Chemistry, Howard University; Dr. Matthew P. Thekaekara, Professor and Head of Physics Department at Georgetown University; and Dr. Donald Long Waidelich, Professor of Electrical Engineering, University of Missouri.

Graduate Students Participating this program are: Edward E. Beasley, Associate Professor of Physics, Gallaudet College; Bruce Friedman, Syracuse University; Donald R. Haskell, University of Buffalo; James E. A. John, University of Maryland; Joel I. Leonard, New York University; George Pick, Catholic University; Michael E. Pittman, University of Maryland; and Stefan Schreier, University of Maryland.

Goddard's AD HOC Steering Committee consists of: Chairman, Dr. Elias Klein; Secretary, William H. Meyer; Test & Evaluation Division, John C. New; Asst. Chief, Test & Evaluation Division, John H. Boeckel; and Chief, OTS, Leopold Winkler.

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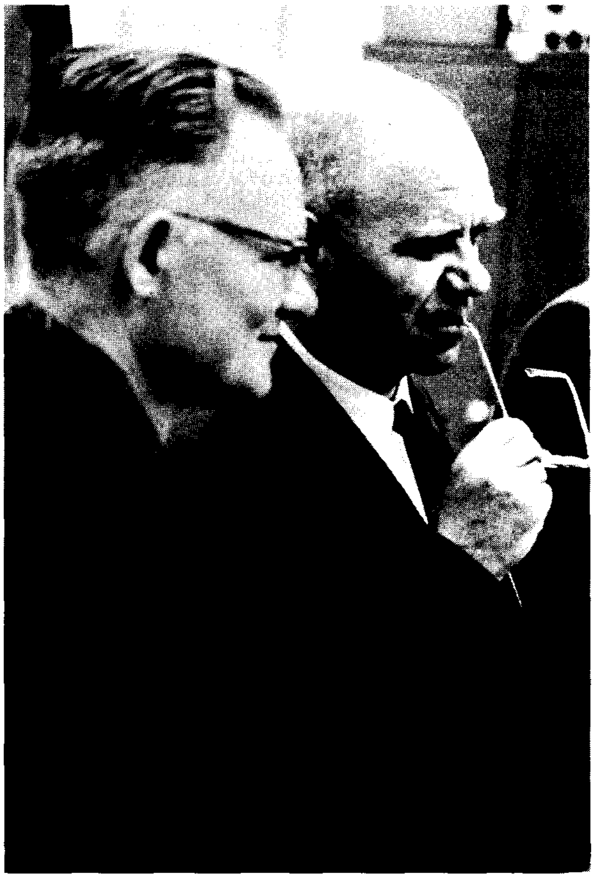
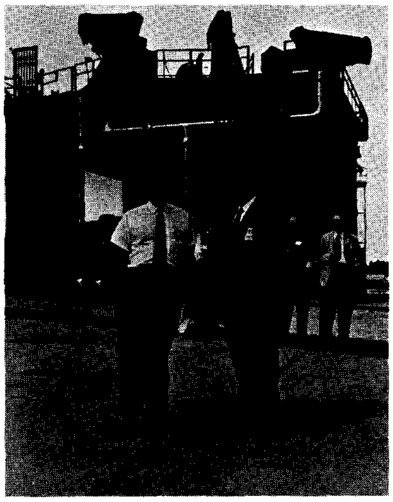


TOP—ASSOCIATE DIRECTOR Eugene W. Wasielewski; Dr. S. N. Vernov, U.S.S.R., Mr. Herman La Gow, Assistant Director of Space Science and Satellite Applications Directorate, and Dr. S. L. Mandel'shlam, U.S.S.R., (left to right) discuss Goddard's S-6 satellite.

LEFT—PROFESSOR G. S. Chebotarev and Dr. A. Shchepotken, members of the Academy of Science of the U.S.S.R. hear a Goddard project described.

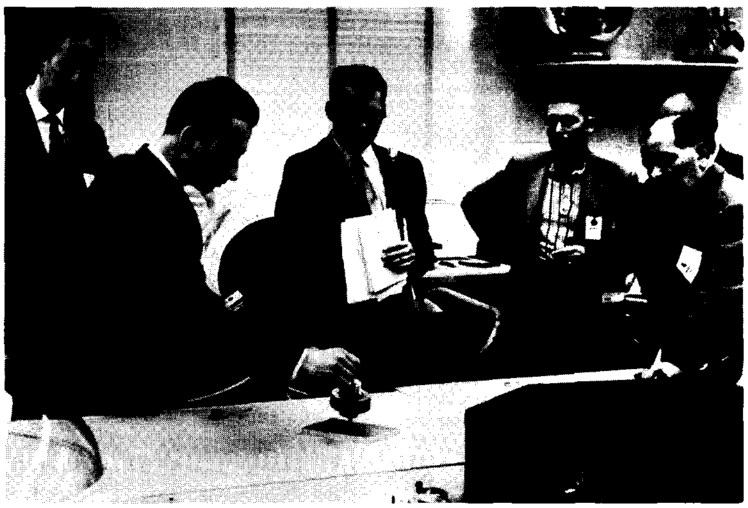
The General Assembly of COSPAR (Committee on Space Research of the International Council of Scientific Unions) met in Washington earlier this month. During the ten-day meeting, Goddard Scientists participated in numerous sessions (See Goddard News dated May 4, 1962).

As part of the Assembly, Dr. Harry J. Goett, Goddard Director accompanied a group of COSPAR Scientists on a tour of Cape Canaveral, while Mr. Eugene W. Wasielewski, Goddard's Associate Director was host to some fifty U.S. and foreign scientists visiting the Center.



Dr. Harry J. Goett (left), with Dr. K. Debus, Director of Launch Operations Center at Cape Canaveral.

At COSPAR Conference—Goddard's Dr. James P. Heppner discusses Explorer X experiments.



Goddard's Don Fitzpatrick, briefs an international group. Left to right: Bengt Feldreich, Swedish TV & Broadcasting Studio; Fitzpatrick; Olaf G. Remmler, U.S. National Bureau of Standards; R. Chinnick, Defence Research Board, Canada; H. Faust German Weather Service, Offenbach, Germany.

E. Van Driest, North American Aviation; S. Matsushita and F. Meyer both of High Altitude Laboratory, Boulder Colorado; G. S. Chebaterev, U.S.S.R.; T. Bazso, Hungarian Embassy, Washington, D. C. and Dr. Andre Brichant, NASA consultant, attentively listen to technical briefing.